

**REMARKS**

Claims 49, 50, 55-72, and 77 are pending in this application. By this Amendment, claims 49 and 77 are amended, and claims 73, 74, and 78 are canceled. Support for the amendments to the claims may be found, for example, in the specification at page 31, line 18 to page 32, line 4; and page 41, lines 6-11. No new matter is added.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

**I. Rejections Under 35 U.S.C. §103**

The Office Action, under 35 U.S.C. §103, rejects:

- (1) Claims 49 and 50 as having been obvious over U.S. Patent Application Publication No. 2003/0116082 to Sakurada et al. ("Sakurada") in view of U.S. Patent No. 5,361,721 to Takano et al. ("Takano"), U.S. Patent No. 5,762,672 to Ikeda et al. ("Ikeda") and U.S. Patent No. 5,067,989 to Yokota et al. ("Yokota");
- (2) Claims 55-64, 74, and 78 as having been obvious over Sakurada in view of Takano, Ikeda and Yokota, and further in view of U.S. Patent Application Publication No. 2003/0000457 to Oda et al. ("Oda");
- (3) Claims 65-73 as having been obvious over Sakurada in view of Takano, Ikeda, Yokota and Oda, further in view of U.S. Patent No. 6,344,083 to Holder et al. ("Holder"); and
- (4) Claim 77 as having been obvious over Sakurada in view of Takano, Ikeda and Yokota, further in view of U.S. Patent No. 6,068,699 to Tsuji et al. ("Tsuji").

Claims 73, 74, and 78 are canceled, rendering their rejection moot. As to the remaining claims, Applicants respectfully traverse the rejections.

**A. Claim 49**

Claim 49 is directed to a method for producing a silicon single crystal where a Cu concentration in an observation window made of quartz provided in the furnace for silicon single crystal growth is 10 ppb or less. Applicants discovered new crystal defects in silicon single crystals and the source of such defects correlates with the Cu concentration in the observation window, which is not directly in contact with the silicon melt but is attached to the ceiling of the growth furnace. See specification at page 30, line 18 - page 33, line 10; and page 41, lines 6-11. The applied references would not have rendered obvious the claimed subject matter for at least the following reasons.

An ordinarily skilled artisan would not have arrived at the claimed subject matter in view of the applied references. Conventionally, an observation window made of quartz that is positioned in a part of the furnace having a relatively low temperature of less than 1000°C and away from a silicon single crystal to be grown (e.g., not directly in contact with the silicon melt) has little effect on the crystal quality of the silicon single crystal. Thus, high purity components are not typically used for such components made of quartz. See specification at page 32, line 13 to page 33, line 3.

Indeed, the only components that have high purity disclosed in the applied references are those that directly contact the silicon melt. For instance, Takano discloses a high purity quartz partition ring dipped into the silicon melt, and Ikeda discloses a quartz glass crucible made of high purity quartz glass. See Takano at col. 6, lines 50-60; and Ikeda at col. 1, lines 5-10. Both the partition ring and crucible are directly in contact with the silicon melt.

While the applied references teach increasing the purity of components that directly contact the silicon melt, the applied references would not have provided any motivation to use high purity components (which are expensive) for an observation window made of quartz that is not directly in contact with the silicon melt. There is nothing of record indicating that a

- quartz observation window was recognized in the prior art as or suspected of being a contamination source at the time of Applicants' invention. Rather, it was the Applicants that discovered that the relatively small amounts of Cu present in quartz observation windows were a contamination source contributing to the new crystal defects in silicon single crystals. See, e.g., specification at page 32, lines 4-8; and page 41, lines 6-27.

MPEP §2141.02(III) provides that a patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified, citing to *In re Sponnoble*, 405 F.2d 578, 585 (CCPA 1969). As explained in MPEP §2141.02(III), the claim in question in *Sponnoble* was directed to a plural compartment mixing vial having a center seal plug placed between two compartments for temporarily isolating a liquid-containing compartment from a solids-containing compartment. The claim differed from the prior art in the selection of the plug material. The prior art recognized that leakage from the liquid to the solids compartment was a problem, and considered the problem to be a result of moisture passing around the center plug because of microscopic fissures inherently present in molded or blown glass. The court found that the inventor discovered the cause of moisture transmission was through the center plug, and there was no teaching in the prior art that suggested the necessity of selecting applicant's plug material that was more impervious to liquids than the natural rubber plug of the prior art.

Applicants respectfully submit that the facts at issue here are similar to those of *In re Sponnoble* in that the prior art recognized that objects in direct contact with the silicon melt were potential sources of contaminating Cu, but did not recognize that a quartz observation window as being a contamination source. It was the Applicants' discovery of this problem that led to the claimed invention, and there was no teaching in the prior art that suggested reducing the Cu content in the quartz observation window.

**B. Claim 77**

Claim 77 requires that the Cu concentration in an observation window made of quartz provided in the furnace for single crystal growth is 10 ppb or less. The deficiencies of Sakurada, Takano, Ikeda and Yokota with respect to this claim feature are discussed above. Tsuji, which is applied by the Office Action for the additional features recited in claim 77, does not cure the deficiencies of Sakurada, Takano, Ikeda and Yokota with respect to this claim feature.

**C. Conclusion**

For at least these reason, the applied references would not have rendered obvious claim 49 and its dependent claims, nor claim 77. Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

**II. Conclusion**

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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WPB:TTK

Attachments:

Petition for Extension of Time  
Request for Continued Examination

Date: July 1, 2011

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